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PATENT SPECIFICATION

DRAWINGS ATTACHED

867987

Date of Application and filing Complete Specification:
March 3, 1960. No. 7495/60.

Complete Specification Published: May 10, 1961.

Index at Acceptance:- Classes 87(2), A1R(14C2:14D:39X); and 120(3)?; M2(L:P).

International Classification:- B29d,g. D02p.

COMPLETE SPECIFICATION

Coil Former and Method of making the same

I, WILLIAM FREDERICK STAHL, of 423 Abbottsford Road, Kenilworth, Illinois, United States of America, a citizen of the United States of America, do hereby declare the invention for which I pray that a patent may be granted to me and the method by which it is to be performed to be particularly described in and by the following statement:-

This invention relates to a coil former and a method of making it, and more particularly to a coil former having terminal flanges anchored thereon and to a method for providing that structure.

Coil formers are used today in vast quantities as the support structure upon which electric coils are wound. Substantially all of the formers have an elongated core generally equipped at one or both ends either with terminal flanges or solder lug collars. Where terminal flanges are employed, they serve a number of important functions, such as determining the length of the wire coil, mechanically protecting the coil from damage and electrically insulating it. It is important that the flanges be accurately positioned upon the core and firmly anchored thereto.

An object of this invention is to provide a coil form in which terminal flanges are firmly and accurately secured upon a core and to provide also a novel method of achieving this end. Another object of the invention is in providing a coil former in which the ends of the core are flared or swaged outwardly and in which ridges are provided adjacent the flared ends and spaced therefrom, both of which serve to lock terminal flanges upon the core when those flanges are interposed between the ridges and flared ends. Still another object is in the provision of a method for making a coil former in which the core is impregnated with a thermosetting resin that is partially cured prior to the positioning of the terminal flanges upon the core, the resin being cured substantially to completion thereafter while the flanges and core are brought into tight frictional engagement. A further object is in providing a method of making coil formers or bobbins as described, in which a core impregnated with a thermosetting resin, and being equipped with terminal flanges, has the end portions thereof swaged by heated swaging tools, whereby the resin, at least in the area adjacent the flanges, is cured to completion while the core is forced into tight engagement with the flanges. Additional objects and advantages will appear as the specification proceeds.

Method and structural embodiments of the invention are illustrated in the accompanying drawing, in which:-

Figure 1 is a perspective view of a coil former,

Figure 2 is a longitudinal sectional view of a core;

Figure 3 is a broken longitudinal sectional view showing one step in the method wherein a core is heated;

Figure 4 is a longitudinal sectional view showing terminal flanges being positioned upon a core; and

Figure 5 is a longitudinal sectional view showing the swaging step in the method.

A typical coil former 10 is illustrated in its entirety in Fig. 1 and comprises a core 11 equipped at its ends with terminal flanges 12 and 13. In the illustration given, each of the terminal flanges has an offset inwardly extending shoulder 14 about the central opening 15 therethrough (Fig. 4) which provides a perimetric channel 16 along

the outer surface of the flanges about the opening 15. If desired, the flanges 12 and 13 may be provided with apertures 17 therethrough which may serve to accept cap screws in mounting the coil form on a chassis, and may also serve to accept soldering lugs to which the ends of the coil (not shown) may be secured.

The core 11 may have any desired cross-sectional configuration and in the drawing the core is shown as being substantially square. The core, however, may be round, rectangular or may have any polygonal shape. The core 11 is preferably a laminated paper tube which can be formed by spirally winding a plurality of paper strips about a mandrel in a conventional manner. The core 11 is impregnated with a thermosetting material and I have found that thermosetting resins are particularly suitable. A number of different resins in this class may be employed, such as, for example, phenol formaldehyde, urea formaldehyde, silicon resin, etc. The resin impregnation of the core 11 may be carried out by procedures well known to those skilled in the art and which then will not be described in detail. For example, the core 11 may be submerged in a closed tank containing the resin in solution and vacuum and pressure alternately applied to the tank to permeate the core with the resin.

The terminal flanges 12 and 13 may also have any desired configuration and the central opening 15 therethrough will conform to the cross-sectional shape of the core 11 and will be adapted to snugly receive the core. The flanges will project laterally from the core, as shown in Fig. 1, and will serve to confine, protect mechanically and insulate electrically a coil wound upon the former. The offset shoulder portions 14 may be formed in the flanges by simply pressing the shoulders outwardly in suitable dies.

Referring particularly to Fig. 5, it is seen that the flanges 12 and 13 are rigidly anchored upon the core 11 by means of the swaged or outwardly flared end portions 18 and 19 at opposite ends of the core and which extend into the peripheral recesses 16 provided by the flanges. Inwardly of the flanges 12 and 13, the core 11 provides a raised or outwardly projecting ridge or rib 20 that substantially abuts the inner surface of each flange. The flanges then are locked or anchored against axial movement relative to the core 11 by the flared ends 18 and 19 and the ridges or ribs 20. It is noted that the core 11 is provided with a longitudinally extending passage 21 through the center thereof which is useful in accepting iron cores for the electric coil and which is also useful in forming the coil former as will be described hereinafter.

In the method of forming the coil former 10 a thermosetting resin impregnated core 11 is first provided, as is illustrated in Fig. 2. As is well known, thermosetting resins have a curing cycle dependent upon time and temperature. When the core 11 is taken from the impregnating solution, the resin at that time is not cured and is a liquid that is sticky or tacky when touched. The core 11 in that condition is subjected to a treatment wherein the thermosetting resin is partially cured, and is preferably cured to the extent that it is no longer tacky or sticky and the core can then be handled with relative ease.

I prefer to partially cure the resin by placing the impregnated core 11 in an oven, such as shown in Fig. 3 and which is designated generally with the numeral 22. Suitable ovens are well known in the art and a typical oven, as shown, may include a platform or conveyor 23 upon which the core 11 is supported, an enclosure member that will provide a confined oven space, and which is not shown, a source of heat, such as the infra-red light 24, and perhaps a reflector member 25 mounted adjacent the heat source 24 and which functions to direct the heat rays toward the core 11. The time or temperature, or both, within the oven 22 may be controlled so that for the period that each of the impregnated cores is within the oven, the impregnating resin will obtain a partially cured or semi-cured condition.

After the resin has been partially cured so that the core 11 can be handled with relative ease, the terminal flanges 12 and 13 are positioned upon the core as shown in Fig. 4. The flanges are moved to preselected points along the core 11 so that the spacing between the flanges meets the specifications of the user of the core former. The flanges may be mounted either by machine or by hand.

After the flanges have been positioned at desired points upon the core 11, the core and flanges are forced into a tight frictional engagement and the thermosetting resin, at least in the area of the core adjacent the flanges, is substantially completely cured. The curing may be accomplished by heating the core for a period of time, such that the time and temperature cycle for the particular thermosetting resin employed will be satisfied.

I prefer to cure the resin and at the same time to lock the flanges upon the core by bringing swaging tools 26 and 27 into engagement with the core 11; the swaging tools are heated by any suitable means, as for example, by equipping each of the swaging tools with resistance elements so that the tools will function in a manner similar to a soldering iron and the tips or noses 28 of the tools will then be heated. If desired, the nose portion of each of the tools may have a central chamber 29 therein communicating with a passage 30 through the shaft 31, which in turn is rigidly secured to the nose. Relatively high temperature fluid may be passed through the passage 30 and into the chamber 29 to heat the nose portion of the swaging tools. As is well known and as is conventional in the art, the swaging tools are provided with a lip 32 adjacent a channel portion 33 which is adapted to receive therein the ends of the core 11.

In simultaneously locking the flanges 12 and 13 upon the core and curing the thermosetting resin, the swaging tools 26 and 27 are inserted into the central passage 21 through the core 11 to bring the end portions of the core into the channels 33 provided by the swaging tools. Force is applied to the tools to move the same toward the center of the core 11 and this will be effective to cause the ends of the core to flare outwardly and into the channels 16 provided by the flanges. Thus, the outwardly flared ends of the core will effectively prevent the flanges from being moved outwardly and off of the core 11. In the time necessary to accomplish that result, the heated swaging tools will elevate the temperature of the core 11, at least in the area thereof adjacent the flanges and for a sufficient length of time to substantially cure to completion the thermosetting resin. When the swaging tools are withdrawn from the core it is found that the ends of the core are swaged or flared outwardly and that the resin is cured.

As part of the swaging and curing operation the ridges or ribs 20 may be formed. Preferably, the ridges are provided by employing swaging tools that are slightly larger than those ordinarily used for swaging cores of the same dimensions. Then when these slightly oversize tools are pressed into the core, they are operative to distort the core slightly in the area thereof inwardly of the flanges and push it laterally (the area under the flanges being reinforced and confined thereby). The setting or curing of the thermoplastic results in this distortion or formation of the ridge being permanent and, as shown in Fig. 5, the flanges are locked or anchored between these ridges and the swaged ends of the core. The rib is a slightly raised portion that may have a thickness of .002 inches.

The temperature within the curing oven and the time that a core is maintained within the oven can be varied to suit the curing cycle of the particular plastic impregnating material being used. That is, the curing cycle of thermosetting plastics varies with the characteristics thereof and it is well known in the art that the time and temperature of the curing cycle may be varied as desired so as to provide a very short cycle or a long one. The same is true of the temperature to which the swaging tools are elevated. I have found it desirable to provide a temperature that results in substantially an instantaneous curing of the resin upon contact of the swaging tools with the core. However, if longer curing cycles are desired, the temperature of the swaging tools may be lowered. In other words, the temperature of the swaging tools and the period of contact thereof with the core may be varied, if desired, to fit any particular manufacturing procedure or to control two tolerances.

The rib or ridge 20 may also be formed in the core 11 by employing swaging tools which have the customary size for a given tube size and by pushing them inwardly or toward each other to a greater extent than is usual and to the point where the ends of the core cannot be further flared outwardly, that is, the flared ends will be confined by the lips 32 of the swaging tools. At this point, the core 11 will buckle slightly and the core distortion will result in the formation of the ridge 20.

WHAT I CLAIM IS:-

1. In a method of making a coil former, the steps of impregnating a core with a thermosetting resin, partially curing the impregnated core to a manipulatable state characterised by the absence of tackiness and stickiness, mounting a flange upon said core in a predetermined position, and substantially simultaneously locking said flange upon said core by deforming said core while curing substantially to completion the impregnating resin, at least in the area of the core adjacent said flange.

2. The method of claim 1, in which a pair of flanges are mounted on said

core in spaced relation to each other and adjacent the ends of said core.

3. In a method of making a coil former, the steps of partially curing the impregnating resin of a fibrous core impregnated with a thermosetting resin to a condition wherein the surface of said impregnated core is characterised by the absence of tackiness and stickiness when manipulated, manipulating said core to mount at least one terminal flange thereon, and simultaneously heating said core in the area of said flange and swaging said core to form a flared end on one side of the flange and a raised rib on the other to anchor the flange on said core.

4. A method of making a coil former, substantially as described and illustrated herein, with reference to the accompanying drawings.

5. A coil former prepared according to the method of any of the foregoing claims.

ERIC POTTER & CLARKSON

Chartered Patent Agents.

Printed in England by Her Majesty's Stationery Office – 1961.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2.
from which copies may be obtained.

867,987 COMPLETE SPECIFICATION

1 SHEET This drawing is a reproduction of the Original on a reduced scale

Fig.1

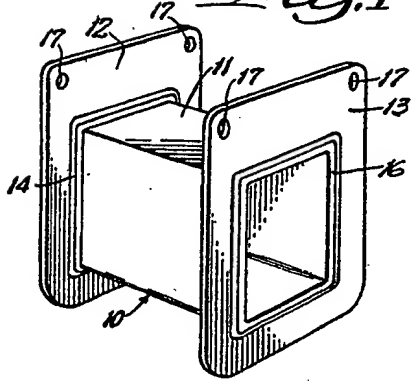

Fig.2

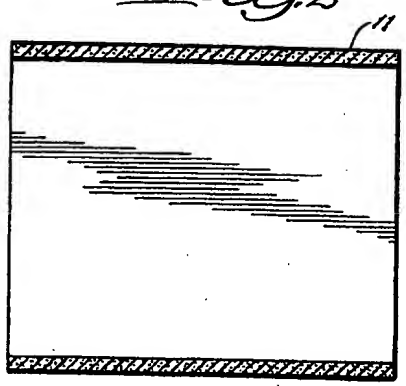

Fig.3

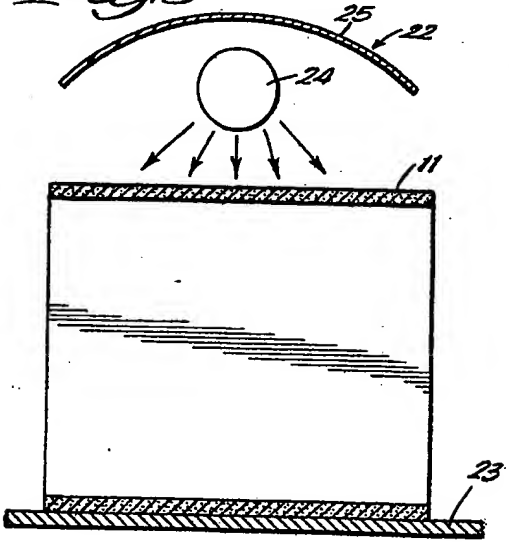

Fig.4

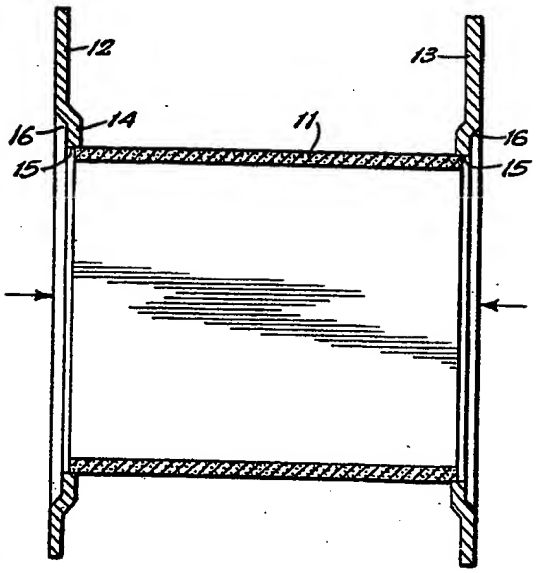

Fig.5